

disappeared, and a severe storm of wind, with rain and snow, prevailed over the Lake region throughout the day. High southerly winds were also reported from the Middle and East Atlantic coasts. The storm passed over the mouth of the St. Lawrence on the 29th and disappeared over the Gulf on the 30th. Cautionary Signals were ordered on the 28th at noon from New York to Lewes, and at 4 p. m. from Lewes to Smithville, and from New York to Portland, which were generally justified as Cautionaries, and were subsequently changed to Off-shore and again justified. In the rear of this storm northerly winds prevailed over the southwest, and Cautionary Off-shore Signals were ordered on the 28th at 7 a. m., at Indianola and Galveston, and were justified. November 28th, Cleveland, "The most severe storm of the season; fences and trees blown down; lake very rough."

XVII.—This was an indefinite area of low pressure which appeared off the coast of British Columbia on the 29th and 30, where it was accompanied by southerly winds and rain. It appears to have passed eastward into British America. Its track is too indefinite to be charted on Map No. I.

No. XVIII.—This depression appears to have been central north of Dakota on the morning of the 30th, and was probably a branch of No. XVII. By midnight it was north of Lake Superior, while high southerly winds and occasional light snows were reported at several stations in the Lower Lake region. Its path is too indefinite to be traced on Map No. I.

## INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present *Review*. No. IV indicates the probable course of low-pressure areas over the North Atlantic ocean and neighboring waters and continents during the month of October, 1879, and is based upon data received at this office up to November 30th, 1879. Nos. V and VI are charts for the month of April, 1878 and are based upon International Simultaneous Observations, as described in the *Review* for July, 1879, supplemented by such other observations as have been considered specially applicable and trustworthy.

Since the publication of the October *Review* valuable reports of observations relating to low-area No. V made at Cienfuegos, Baracoa and Sagua le Grand, Cuba, have been received through Mr. Vines, of Havana, but which do not change the track of centre as already given on Chart No. I for that month.

On Chart No. IV, the tracks of fifteen areas of low-pressure are traced, which, during a portion of their existence, were located over the North Atlantic and North Pacific oceans or neighboring waters. Portions of areas Nos. I, V, VI, XIII and XIV appeared on Chart No. I of October *Review*. No. II was over the eastern portion of the Gulf of Mexico during October 5th and 6th. There are decided indications of its existence during the 3rd and 4th, in the positions, as shown; on the 7th, it merged with an extensive depression over the Northwest. No. IV originated about mid ocean and, on the 11th, 12th and 13th, moved northward off the banks of Newfoundland as a very severe storm. It is probable that the depression which appeared to the northwest of the British Isles on the 16th, was a continuation of this area. Nos. V and VI appeared on Chart I of the October *Review* and are here reproduced, as it is probable that the area formed by their union, moved over the northern portion of the Atlantic, from the 20th to the 25th. Nos. I, III and from VII to XV, can only, as yet, be traced over the area shown.

## TEMPERATURE OF THE AIR.

The general distribution of temperature for *November*, 1879, is shown by the isothermal lines upon Chart No. II, accompanying which is a table of comparative temperatures. Like the preceding month the average temperature of the present month has been above the normal in the districts east of the Rocky Mountains and below the normal in those to the westward. The departure from the normal, however, over the eastern portions of the country has not been so marked as it was for October. The excess is greatest from the Gulf coast to the Ohio and Upper Mississippi valleys, over which region it amounts to four or five degrees; in the Atlantic States, Lake region and along the eastern slope of the Rocky Mountains it varies from a half to one and a half of a degree. West of the Rocky Mountains the departure from the normal has been greater than last month and has amounted to —2.5 degrees along the Pacific coast and from —3 to —5 degrees in Utah and Idaho.

*Minimum and Maximum Temperatures:*—An examination of the minimum temperatures shows that they occurred, with few exceptions, from the 17th to the 22nd, during the regime of high areas Nos. VII and VIII, and ranged, during these days, from —9° at Pembina, Dak., to 39° at Brownsville, Tex.; from 0° at Alpena, Mich., to 32° at Pensacola, Fla.; and from 11° at Eastport, Me., to 60° at Key West. On the summit of Pike's Peak, the minimum (—15°) occurred on the 17th and 18th, and on the summit of Mount Washington (—20°) on the 20th. The exceptions to the above generalization occurred on the 4th in the Lake region; from the 24th to the 28th over the Pacific States, Plateau Districts and Montana, and from the 28th to the 30th, over the Eastern Slope of the Rocky Mountains and Texas. An examination of the maximum temperatures shows that they occurred, almost without exception, during the first half of the month. In the Pacific States, Plateau Districts, Eastern Rocky Mountain Slope, and northern part of the Northwest, they occurred from the 3rd to the 6th, and varied, as follows:—65° at San Francisco, Cal., 80° at Red Bluff, Cal., 67° at Winnemucca, Nev. and Salt Lake City, Utah, 76° at Denver, Col. and North Platte, Neb., and 44° at Breckinridge, Minn. Over the eastern portion of the United States, they occurred chiefly from the 8th to the 15th, and varied from 54° at Escanaba, Mich. and 55° at Eastport, Me., to 92° at Laredo, Tex. and 84° at Key West, Punta Rassa, and Augusta. The maximum on the summit of Pike's Peak (33°) occurred on the 6th, and on the summit of Mount Washington, (44°) on the 9th, 10th and 15th.

*Minimum Temperatures, given by states.*—*Maine*: 2° at \*Orono and 13° at Portland. *New Hampshire*: -20° on Mt. Washington and -8° at Dunbarton. *Vermont*: -10° at \*Woodstock and 7° at Burlington. *Massachusetts*: -2° at Billerica and 16° at Wood's Holl. *Rhode Island*: 14° at Newport. *Connecticut*: 7° at \*Mystic and 17° at New Haven. *New York*: -2° at \*Schroon Lake, 2° at \*Plattsburg Barracks and 17° at New York city. *Pennsylvania*: -1° at \*Dyberry and 19° at Philadelphia. *Delaware*: 20° at \*Dover. *Maryland*: 8° at \*Woodstock and 20° at Baltimore. *District of Columbia*: 15° at Washington. *Virginia*: 8° at \*Mt. Solon and \*Wytheville and 25° at Cape Henry. *West Virginia*: 8° at \*Helvetia and 13° at Morgantown. *North Carolina*: 10° at Highlands and 28° at Cape Hatteras. *South Carolina*: 25° at \*Aiken and 30° at Charleston. *Georgia*: 20° at Gainesville and 33° at Savannah. *Florida*: 27° at \*Houston and 60° at Key West. *Alabama*: 25° at \*Green Springs and 33° at Mobile. *Mississippi*: 30° at \*Fayette and 31° at Vicksburg. *Louisiana*: 25° at \*Okalooska and 38° at New Orleans. *Texas*: 19° at Uvalde and Graham and 43° at Indianola and Galveston. *Ohio*: 8° at \*Ruggles and 21° at Cincinnati. *Kentucky*: 20° at \*Bowling Green and 22° at Louisville. *Tennessee*: 18° at Knoxville and 27° at Memphis. *Arkansas*: 19° at \*Mt. Ida and 30° at Little Rock. *Michigan*: 0° at Alpena and 14° at Grand Haven. *Indiana*: 12° at \*New Corydon and 18° at Indianapolis. *Illinois*: 6° at \*Riley and 25° at Cairo. *Missouri*: 10° at \*Oregon and 21° at St. Louis. *Kansas*: 7° at Dodge City and 16° at Leavenworth. *Wisconsin*: -3° at \*Neillsville and 11° at Madison. *Iowa*: 4° at \*Ames and Boonsboro' and 17° at Keokuk. *Nebraska*: -10° at \*Fort Sidney and 8° at Omaha. *Indian Territory*: 24° at Fort Gibson. *Minnesota*: -4° at Breckinridge. *Dakota*: -9° at Pembina and 8° at Fort A. Lincoln. *Colorado*: -15° at Pike's Peak and 11° at Denver. *New Mexico*: 15° at Santa Fé and 28° at La Mesilla. *Wyoming*: -1° at Fort Fred. Steele and 11° at Cheyenne. *Utah*: -4° at Coalville and 15° at Salt Lake City. *Nevada*: 5° at Winnemucca. *Arizona*: 14° at Prescott and 38° at Yuma. *Idaho*: 16° at Boise City. *Montana*: -5° at Virginia City. *California*: 32° at Visalia and 45° at San Francisco. *Oregon*: 24° at Roseburg.

*Maximum Temperatures.*—*Maine*: 55° at Eastport and 63° at \*Cornish. *New Hampshire*: 44° on summit of Mt. Washington and 70° at \*Dunbarton. *Vermont*: 63° at Burlington and 66° at \*Woodstock. *Massachusetts*: 62° at Wood's Holl and 76° at \*Somerset. *Rhode Island*: 64° at Newport. *Connecticut*: 71° at New London. *New York*: 66° at Buffalo and 74° at \*Ardenia. *Pennsylvania*: 70° at Erie and 79° at \*Milton. *Delaware*: 76° at \*Dover. *Maryland*: 78° at Baltimore. *District of Columbia*: 80° at Washington. *Virginia*: 79° at Lynchburg and Fort Whipple, 83° at \*Accotink and \*Wytheville. *West Virginia*: 77° at \*Helvetia and 76° at Morgantown. *North Carolina*: 74° at Fort Macon and 36° at \*Weldon. *South Carolina*: 82° at Charleston. *Georgia*: 76° at Atlanta and 90° at \*Forsyth. *Florida*: 79° at Pensacola and Key West, and 86° at Houston. *Alabama*: 83° at Montgomery. *Mississippi*: 83° at Vicksburg and 86° at \*Brookhaven. *Louisiana*: 84° at Shreveport and 86° at \*Okalooska. *Texas*: 80° at Galveston and 92° at Laredo. *Ohio*: 75° at Sandusky and Cincinnati and 80° at \*Ringgold. *Kentucky*: 82° at Bowling Green and 78° at Louisville. *Tennessee*: 82° at Memphis. *Arkansas*: 82° at Little Rock. *Michigan*: 74° at \*Hudson and 62° at Alpena. *Indiana*: 78° at Indianapolis and 81° at \*Laconia. *Illinois*: 80° at \*Anna and \*Decatur and 69° at Chicago. *Missouri*: 82° at St. Louis. *Kansas*: 73° at Leavenworth and 80° at \*Cedar Vale, \*Holton and Independence. *Wisconsin*: 67° at Madison and Milwaukee. *Iowa*: 65° at Des Moines and 75° at \*Ames. *Nebraska*: 65° at Omaha and 76° at North Platte. *Indian Territory*: 83° at Fort Sill. *Minnesota*: 44° at Breckinridge and 61° at St. Paul. *Dakota*: 44° at Pembina and 73° at Yankton. *Colorado*: 76° at Denver and 80° at \*Fort Lyon; 33° on summit of Pike's Peak. *New Mexico*: 82° at La Mesilla and 61° at Santa Fé. *Wyoming*: 67° at Cheyenne. *Utah*: 67° at Salt Lake City. *Nevada*: 67° at Winnemucca and 70° at Carson City. *Arizona*: 71° at Prescott and 91° at Yuma. *Idaho*: 62° at Boise City. *Montana*: 57° at Virginia City and 69° at Fort Custer. *California*: 84° at Los Angeles, 80° at Red Bluff and 65° at San Francisco. *Oregon*: 61° at Portland.

Those marked with \* are reported by voluntary observers.

*Ranges of Temperature at Signal-Service Stations.*—The general range of temperature for the whole country has been from -20° on summit of Mount Washington, -15° on Pike's Peak and -9° at Pembina, Dak., to 92° at Laredo, Tex., or a total range of 112°.

The *monthly* ranges have been as follows: *largest* 78° at North Platte, 77° at Fort Custer and 72° at Yankton. The *smallest* has been 20° at San Francisco, 24° at Key West and 37° at Galveston.

The greatest *daily* ranges vary in New England from 21° at Portland to 40° at Burlington and 47° on Mount Washington; Middle Atlantic States, from 24° at Barnegat to 35° at Albany; South Atlantic States, from 18° at Portsmouth to 36° at Augusta and Wilmington; Eastern Gulf States, from 9° at Key West to 30° at Montgomery; Western Gulf States, from 18° at Galveston to 34° at Corsicana; Ohio valley and Tennessee, from 23° at Columbus, 24° at Cairo to 37° at Morgantown; Lower Lakes, from 22° at Erie to 34° at Rochester, Upper Lakes, from 23° at Grand Haven and Milwaukee to 28° at Duluth; Upper Mississippi valley, from 22° at La Crosse to 33° at St. Louis; Red River of the North valley, from 38° at Pembina to 39° at Breckinridge; Lower Missouri valley, from 22° at Fort Stevenson to 42° at Yankton; Texas, from 37° at Henrietta and Laredo to 52° at Uvalde; Eastern Rocky Mountain Slope, from 36° at Deadwood, 45° at Ft. Custer to 46° at Dodge City; Rocky Mountains, from 31° at Virginia City, 36° at Santa Fe, 35° on Pike's Peak to 43° at Denver; Northern and Middle Plateau districts, from 28° at Boise City and Salt Lake City to 43° at Winnemucca; California, from 14° at San Francisco, 31° at Visalia to 36° at Los Angeles.

*Frosts.*—Occurred very generally in all states and territories north of the thirty-seventh parallel. In Florida they were reported on the 19th, 20th, 21st, 22nd, 23rd, 30th; Eastern Gulf States, 2nd, 3rd, 4th, 5th, 7th, 9th, 10th, 12th, 14th, 16th, 18th to 30th; Western Gulf States, 2nd, 8th, 11th, 18th, 19th to 23rd, 28th to 30th; Indian Territory, 2nd, 15th, 18th to 22nd, 29th; New Mexico, 2nd, 5th, 6th, 12th to 15th, 17th to 30th; heavy white frost in northern Arizona on the 12th; California, 1st, 7th, 8th, 10th to 28th.

*Ice* has been reported throughout all districts north of Tennessee and Kansas. In the Eastern Gulf States it formed on the 4th, 5th, 21st, 22nd, 23rd, 29th and 30th; In Western Gulf States, on the 4th, 18th, 19th, 20th, 21st, 29th; In Texas and Indian Territory, on the 18th, 19th, 20th, 21st, 29th; At Princeton, Cal., on the 18th and 19th.

*Ground Frozen.*—Ames, Ia. 27th to 30th; Nora Springs, Ia., 3rd; Tabor, Ia., 30th; Cedar Vale, Kan., 20th, 21st, 24th, 29th; Oregon, Mo., 18th, 19th; Ashley, Mo., 19th; Flushing, Wy., 3rd; West Charlotte, Vt., 1st, 2nd, 19th, 21st, 30th; Ft. Gibson, Ind. Ter., 19th, 29th; Keokuk, Ia., 19th, 29th; Springfield, Ill., 20th.

## PRECIPITATION.

The general distribution of rainfall for the month is illustrated as accurately as possible on Chart No. III, from about 500 reports; this chart is accompanied by a table giving the average precipitation for the month of November by districts. This table shows the rainfall to have been decidedly below the normal throughout the Atlantic and Gulf States, and at Portland, Oregon. In the Middle Atlantic and Eastern Gulf States this deficiency amounts to more than two inches, and the severe droughts previously reported have continued throughout the present month from New Jersey to North Carolina, and in southern Texas. A small deficiency is reported in the Upper Missouri Valley and Minnesota. In the Lake region, Upper Mississippi, and Lower Missouri valleys there is a large excess, amounting in the last district to more than three inches. The combined reports from San Francisco and San Diego show an excess of nearly two inches, which is due to the heavy rains attending low areas Nos. IV and XVIII. Regarding the rain-fall in Missouri, Prof. Nipher states in the *Missouri Weather Review* that "the greater portion of the rain fell between the 10th and 20th, and was followed by a marked rise in the rivers; these rains occurred as frequent and moderate showers, and were of great benefit to fall crops, checking also the ravages of the Hessian fly.

*Special Heavy Rainfalls.*—3rd, Holton, Kan., 3.00 inches. 6th, Ft. Barrancas, Fla., 3.83 in. 8th, Howard, Neb., 2.44 in.; Leavenworth, 2.56 in.; Manhattan, Kan., 2.31 in.; Waterville, Kan., 2.00 inches in 8 hours. 9th, Okalooska, La., 5.20 in.; Los Angeles, Cal., 3.41 in.; Calistoga, Cal., 2.60 in.; San Diego, 2.75 in. 9th and 10th, San Geronio, Cal., 3.92 in. 10th, Pierce City, Mo., 2.00 inches in 2 hours and 40 min. 10th and 11th, Sterling, Ill., 3.40 in.; Holton, Kan., 2.75 in.; Howard, Neb., 3.50 in.; Plattsmouth, Neb., 3.58 in.; Lawrence, Kan., 2.65 in. 11th, Des Moines, 2.58 in.; Leavenworth, 2.58 in.; Guttenburg, Iowa, 2.60 in.; Litchfield, Mich., (10th to 12th) 3.00 in. 11th and 12th, Kansas City, Mo., 2.69 in.; Glenwood, Iowa, 2.95 in.; Thornville, Mich., 2.50 in.; Manhattan, Kan., 4.81 in.; Brookhaven, Miss., 2.60 in.; Waterville, Kan., 4.18 in. 14th and 15th, Arlington, Ind., 3.00 in. 15th, Vicksburg, 1.82 inches in 20 minutes. 17th and 18th, Murphy, N. C., 2.70 in. 18th, Thatcher's Island, 3.14 in.; Northport, Mich., 2.90 in. 18th and 19th, Fayetteville, N. C., 3.00 in. 27th and 28th, Highlands, N. C., 2.80 in. 28th, Vicksburg, 1.81 inches in 1 h. 20 min. 29th and 30th, Calistoga, Cal., 3.20 in.; Red Bluff, 3.15 in.; San Francisco, 2.24 in.; Princeton, Cal., 1.98 in.

*Largest Monthly Rain-falls, including Melted Snow:*—Mt. Washington, 9.53 inches; Savannah, Mo., 8.90 inches; Alta, Cal., 9.13 inches; Fort Barrancas, Fla., and Ironton, Mo., 8.72 inches; St. Joseph, Mo., 8.45 inches; Erie, 8.35 inches; Okalooska, La., 8.03 inches; New Hope township, Union county, Iowa, nearly 8.00 inches; Leavenworth, 7.85 inches; Manhattan, Kans., 7.83 inches; Oregon, Mo., 7.81 inches; Grafton, N. H., 7.70 inches; Holton, Kans., 7.65 inches; Litchfield, Mich., 7.25 inches; Calistoga, Cal., 7.24 inches; Grand Haven, 7.23 inches; Northport, Mich., 6.93 inches; Thatcher's Island, Mass., 6.91 inches; Milan, Mo., 6.72 inches; Centreville, Mo., 6.82 inches; College Hill, Ohio, 6.75 inches; Des Moines, 6.49 inches; Howard, Neb., and Grand Rapids, Mich., 6.46 inches; Port Stanley, 6.43 inches; Coldwater, Mich., and Quebec, Can., 6.36 inches; Independence, Iowa, 6.30 inches; Fort Leavenworth, Kans., 6.26 inches; Neosho, Mo., 6.22 inches; Niles, Mich., 6.14 inches; Madison, Wis., and New Corydon, Ind., 6.02 inches; Memphis, 6.01 inches; Pierce City, Mo., and Fort Wayne, Ind., 6.00 inches; Redding, Cal., 5.96 inches.

*Smallest Monthly Rain-falls, including Melted Snow:*—At Randall, Dak., La Mesilla, N. M., Concho Davis, Laredo, Rio Grande and Edinburg, Tex., none; Fort Hartsuff, Neb., Castrovillo and Stockton, Tex., trace; El Paso and Uvalde, Tex., 0.01 in.; Salt Lake City, 0.02 in.; Socorro, N. M., and Eagle Pass, Tex., 0.03 in.; Fort Abraham Lincoln, Dak., Fort Griffin, Tex., and Dodge City, 0.04 in.; Camp Sheridan, Neb., Boerne and Brackettville, Tex., 0.05 in.; Fort Stevenson, Dak., 0.06 in.; Olivet, Dak., 0.07 in.; Coleman, Tex., 0.08 in.; Fort Lyon, Col., Fort McPherson, Neb., and North Platte, 0.10 in.; Fort Keogh, Mont., 0.11 in.; Indianola, 0.13 in.; Pilot Point and Brownsville, Tex., 0.14 in.; Bismarck, 0.16 in.; Fort Sidney, Neb., and Castrovillo, Tex., 0.18 in.; Fort Custer, Mont., 0.19 in.; Denver, 0.21 in.; Yankton and Cheyenne, 0.23 in.; Cedar Keys, Fla., and Sumner, Cal., 0.24 in.; Fort Fred Steele, Wyo. Ter., and Graham, Tex., 0.25 in.; Deadwood and Fort Sill, 0.27 in.; Silver City, N. M., 0.28 in.; Fort Monroe, Va., and Breckenridge, 0.29 in.; Fort McHenry, Md., Gulf Hammock, Fla., 0.30 in.; Henrietta, Tex., Pembina, Dak., and Tulare, Cal., 0.34 in.; Punta Rassa, 0.35 in.; Fort Buford, Dak., 0.37 in.; Fredericksburg, Tex., 0.38 in.; Johnstown, Va., 0.40 in.; Weldon, N. C., 0.41 in.; Norfolk, 0.42 in.; Jacksboro and Decatur, Tex., 0.45 in.; Fort Garland, Col., 0.48 in.; Dover Mines, Va., 0.55 in.; Fort McKavett, Tex., 0.57 in.